

Appl. No. 10/608,675
Amdt. dated April 20, 2004

REMARKS

Claims 1-4 have been amended. Claim 5 has been added. Claims 1-5 remain pending. Reconsideration and reexamination of the application, as amended, are requested.

The Examiner rejected claims 1-4 under 35 USC §103(a) as being obvious on consideration of Boyd. Claim 1 has been amended to clarify that the lens is a convex lens having a lens principal plane parallel with the diaphragm, and the mark is provided on the surface of the diaphragm opposite the convex lens to undergo movement in unison with the diaphragm relative to the convex lens. Claim 1 further recites that the mark when viewed through the convex lens from the outside of the chamber forms an image, and a pressure rise on the secondary side of the filter or a pressure drop at the primary side of the filter that is created due to soiling (or clogging) of the filter causes the diaphragm and the mark provided thereon to move toward or away from the convex lens so that the image of the mark viewed through the convex lens from the outside of the chamber varies in size with the degree of soiling (or clogging) of the filter.

In rejecting claim 1, the Office action states that it would have been obvious to one of ordinary skill in the art at the time of the invention to have defined the red colored poppet as a "mark" on the diaphragm since the image of the color is used as an indicator viewed through the lens. We disagree with this rejection.

Boyd (US '832) shows in Figs. 8 and 9 a magnetic indicator assembly 16 that is arranged to keep or hold a clogged condition of the filter once clogging of the filter occurs. To this end, the diaphragm 31 and a poppet 30 are in contact with each other but they are separate pieces from one another.

More specifically, under normal operating condition shown in Fig. 8, a first magnet 32 mounted within the poppet 30 and a second magnet 33 mounted within a partial through-bore 39 of a lens 28 repel one another to force the poppet 30 downwardly against an upper surface of the diaphragm (see column 4, line 64 to column 5, line 2).

When the filter becomes clogged, pressure will increase within the filter, causing the diaphragm 31 to deflect upwardly as shown in Fig. 9. This upward deflection is sufficient to

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move the first magnet 32 above the second magnet 33 such that both magnets 32, 33 repel one another, causing the poppet 30 to travel upwardly in the bore 39 as far as possible (see column 5, line 3-8). Owing to the repelling force of the magnets 32, 33 and since the poppet 30 is a separate piece from the diaphragm 31, the poppet 30 is held in the raised position shown in Fig. 9 once clogging of the filter occurs. This condition will continue even when the change 38 recovers a normal pressure, allowing the diaphragm 31 to extend flat as shown in Fig. 8.

If a modification were made to provide the poppet 30 on the diaphragm 31, as the Examiner has done, a pressure drop created in the housing 10 after clogging of the filter would cause the diaphragm 31 to deflect downwardly to thereby lower the poppet on the diaphragm from the raised position shown in Fig. 9 and the normal position shown in Fig. 8. Thus, the modified indicator assembly 16 would fail to achieve its intended operation to indicate the fact that clogging of the filter has occurred. Stated in other words, a modification of Boyd as proposed by the Examiner would bring about a result contrary to the teaching of Boyd and, therefore, cannot be derived from Boyd.

Further distinction from Boyd is that with the use of a convex lens, the image of the mark viewed through the convex lens can be greatly changed in size even when the displacement of the diaphragm, which is caused due to a change in pressure within the chamber, is small.

In Boyd, the occurrence of filter clogging is determined by a change in shading of the poppet 30 colored in red. To cause the necessary change in color shading, it is necessary for the poppet 30 to move upward within the lens bore 39 until the first magnet 32 moves past the second magnet 33. With this arrangement, traveling stroke of the poppet 30 is relatively large. Additionally, the indicator assembly 16 showing Boyd essentially comprises a lens 28, diaphragm 31, poppet 30 and magnets 32, 33 and hence the indicator assembly 16 is complicated in construction and large in size as compared to the filter soil detecting device of the invention which requires a convex lens, a diaphragm and a mark on the diaphragm. Furthermore, the indicator assembly 16 of Boyd is suitable for an application in which a pressure change created due to clogging of the filter is relatively large and the displacement of the diaphragm caused to the pressure change is also relatively large. As against the Boyd assembly, the filter soil detecting device of the construction as recited in claim 1 is particularly advantageous when used

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in an application in which a pressure change or difference created due to soiling or clogging of the filter is relatively small and the displacement of the diaphragm caused due to the pressure change is also relatively small.

Claims 2-4 have been amended in formal respects. Claim 5 has been added to cover an arrangement in which clogging of the filter can be detected by way of a change in feature of the image from a virtual image to a real image or from a real image to a virtual image, as in the illustrated embodiments.

The Examiner rejected claims 1-4 under 35 USC §112, second paragraph, as being indefinite. The Examiner's comments have been considered, and it is submitted that claims 1-4 are definite.

In view of the above, it is submitted that the application is in condition for allowance. Reconsideration and reexamination are requested. Allowance of claims 1-4 at an early date is solicited.

Respectfully Submitted,

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